# RADIONUCLIDE SOIL ACTION LEVEL REGULATORY ANALYSIS

## PURPOSE

The Department of Energy (DOE), the Environmental Protection Agency (EPA) and the Colorado Department of Public Health and the Environment (CDPHE) are currently reevaluating the Radionuclide Soil Action levels (RSALs) that will govern much of the cleanup at Rocky Flats Among the reasons for the reevaluation are that the draft EPA Radiation Sites Cleanup Rule that was used as a basis for the current RSALs is defunct and DOE, EPA and CDPHE are also considering the recommendations of the Radionuclide Soil Action Level Oversight Panel regarding its review of the RSALs

This paper discusses relevant regulatory and guidance developments and makes a proposal as to what should form the basis of a new RSAL This analysis is specific to the Rocky Flats Environmental Technology Site and The Rocky Flats Cleanup Agreement (RFCA), signed by DOE, CDPHE and EPA in 1996, and is not intended to represent any agency's positions with respect to other sites or other cleanup agreements

In many instances this paper summarizes or paraphrases specific RFCA or regulatory language, to (hopefully) improve readability The interested reader should refer to the cited authority for the specific text

## BACKGROUND

In October of 1996 DOE, EPA and CDPHE established an action level for radionuclide contamination in soils at Rocky Flats[b] In short, An action level is a numeric level that, when exceeded, triggers an evaluation, remedial action, and/or management action The radionuclide soil action level (RSAL) is expressed in terms of the amount of radioactivity per unit mass of soil, specifically picocuries/gram (pCi/g) Having an RSAL that is protective of human health is a key element in planning and executing the overall cleanup of Rocky Flats

When developing the current RSAL in 1996 DOE, EPA and CDPHE used the draft EPA Radiation Site Cleanup Regulation, 40 CFR 196, as the basis for the action level At that time, EPA had only announced its intent to propose this regulation, it had not been finalized However, since all three parties anticipated that it would be finalized and that there was nothing else in existence resembling a national standard for radiation cleanup, DOE, EPA and CDPHE believed the draft regulation was a reasonable basis for an RSAL

40 CFR 196 stated that a radioactively contaminated site should be cleaned up such that any remaining contamination would result in a radiation dose to a member of the public no greater than 15 millirem/year (mRem/yr) The draft rule went on to say that if institutional controls (i e legal controls that restricted Site access) were utilized to meet the 15 mRem/yr limit, the Site must, at a minimum, be cleaned up to levels that ensure individuals

[b] **See, "Action Levels for Radionuclides in Soils for the Rocky Flats Cleanup Agreement", Final 10/31/1996**



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do not receive doses greater than 85 mRem/yr in the event the institutional controls failed (e g a property zoned for industrial use is later zoned for residential use)

To determine what soil action level would meet the 15/85 mRem/yr requirements of the draft rule, DOE, EPA and CDPHE used the generally accepted software program called RESRAD to calculate the amount of radioactivity in the soil that would result in a 15 mRem/yr or 85 mRem/yr dose to a future site user In order to make that calculation, assumptions were made as to how the land will be used in the future The assumption as to the future use of a site is one of the most important factors in assessing the risk posed by a contaminated site because a person who lives on a contaminated site will have a much higher dose than a person who occasionally visits the site RFCA envisioned that future use of Rocky Flats would consist of commercial/light industrial activity in the southern portion of the 400-acre Industrial Area that lies at the center of the Rocky Flats property and open space/recreational activity in the surrounding Buffer Zone Using these land-use assumptions as a guide, the parties calculated the amount of contamination that would result in a 15 mRem/yr dose to an office worker in a commercial setting and a recreational open space user Since these two future use assumptions were predicated on the idea that legal controls would be put in place precluding other types of land use, the parties had to satisfy the second part of the draft EPA rule that in the event those legal controls fail, future site users do not receive a dose in excess of 85 mRem/yr It was assumed that if there were no restrictions on the use of Rocky Flats, a subdivision similar to Rock Creek would be constructed So the parties calculated the level of contamination that would equate to an 85 mRem/yr dose to a suburban resident

The calculated RSALs for these various scenarios are given below

| Scenario | Specific Activity Pu-239[1] |
|---|---|
| 15 mRem/yr Dose to Office Worker | 562 pCi/g |
| 15 mRem/yr Dose to Open Space User | 4,145 pCi/g |
| 85 mRem/yr Dose to Suburban Resident | 651 pCi/g |

To set an RSAL for the Industrial Area, the parties compared the office worker at 15 mRem/yr to the hypothetical future suburban resident at 85 mRem/yr, and chose the most conservative value Similarly, for the Buffer Zone RSAL, the open space user at 15 mRem/yr was compared to the hypothetical future suburban resident at 85 mRem/yr This is how the current RSALs of 562 pCi/g Pu-239 in the Industrial Area and 651 pCi/g Pu-239 in the Buffer Zone were chosen

DOE, EPA and CDPHE also established a lower tier of RSALs that would trigger a different type of action than the "Tier 1 RSALs" discussed above When contaminants are found to exceed the Tier 1 action level, it will generally trigger an action such as removal or stabilization in place Exceeding the Tier 2 value would generally trigger a less aggressive action which may include "hotspot" removal, capping or access restrictions The Tier 2 RSAL for Pu-239 is based on a 15 mRem/yr dose to a suburban resident and

[1] The specific activity given is a sum-of-the-ratios number that assumes Am-241 is present and the ratio of Am-241 to Pu-239 is 0 18



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comes out to 115 pCi/g

## CHANGES IN THE REGULATORY LANDSCAPE

Introduction

The EPA Radiation Sites Cleanup Regulation was never finalized, and has been officially dropped from consideration In the meantime, another national regulation on radiation cleanup was finalized as well as some EPA policy documents on the subject These developments called the regulatory basis for the current RSALs into question

The RFCA parties as part of this review are considering two principal regulatory authorities as the basis for revised RSALs These are the NRC Decommissioning Rule and the guidance and policy promulgated by the Environmental Protection Agency to implement the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA ) This paper reviews these sources at some length For the purposes of setting an RSAL, these sources can at times be ambiguous Both of these sources address action levels – the level of contamination that triggers a remedial action – and cleanup levels, which is the level of contamination remaining after an action has been taken The specific charge of this review is to consider changes to RSALs, but any discussion of RSALs must also be accompanied by discussion on how ultimate cleanup levels will be determined Both sources of new regulatory guidance address action levels and cleanup levels simultaneously

The NRC Rule

In 1997, the NRC promulgated a cleanup regulation (commonly referred to as the Decommissioning Rule)[c] which governs the cleanup of facilities that are licensed by the NRC, or by States that have had that authority delegated to them The NRC cleanup regulation states that a site will be considered acceptable for unrestricted use if residual radioactivity, distinguishable from background, results in a dose to the average member of the critical group[ii] no greater than 25 mRem/yr, and the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA) The rule goes on to say a site will be considered for license termination under restricted conditions if

- Residual levels associated with restricted conditions are ALARA.

- The licensee has made provisions for legally enforceable institutional controls

- The licensee has provided financial assurance for control and maintenance of the site

- The licensee has prepared a "License Termination Plan" and has solicited public comment on that plan

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[c] **See, 10 CFR 20, subpart E**

[ii] The term "critical group" is defined in CFR 20 1003 It means the group of individuals reasonably expected to receive the greatest exposure to residual activity for any applicable set of circumstances



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- Residual radioactivity at the site has been reduced so that if institutional controls were no longer in effect, members of the public will not receive a dose greater than 100 mRem/yr or, under certain circumstances, 500 mRem/yr

The NRC does not have regulatory authority over a DOE facility such as Rocky Flats so the NRC rule is not directly applicable to Rocky Flats However, the State of Colorado has adopted the NRC rule as a State regulation and while the rule is not applicable to Rocky Flats the State has identified the rule as relevant and appropriate[d], and therefore, the substantive provisions should be used to govern the cleanup of the site EPA and DOE agree

Here's how EPA, CDPHE and DOE interpret the decommissioning rule, and intend to apply the standards in the rule based upon the significant factors present at Rocky Flats

Cleanup to levels that allow for unrestricted use are generally preferred to cleanups that result in restricted use (Please note that at Rocky Flats, use restrictions may nonetheless be required for purposes other than limiting dose ) The rule does not explicitly require cleanup to unrestricted use, but the RFCA parties believe that an analysis of actions that would be needed to achieve unrestricted use is required

To be acceptable for unrestricted use, the residual radioactivity levels must be "as low as reasonably achievable ("ALARA")," AND in any case may not exceed 25 mRem/yr Put another way, if it is reasonable to achieve a level of residual contamination that results in a lower does than 25 millirems/yr, then the rule requires the additional cleanup action

A site may be cleaned up to less stringent levels that do not allow for unrestricted use only if the required analysis of actions to achieve unrestricted use demonstrates either (1) that the additional cleanup necessary to remove residual radioactive materials to achieve a dose that does not exceed 25 millirems per year (assuming unrestricted use) would cause net public or environmental harm, or (2) that the residual levels of contamination associated with restricted use are ALARA

If a site is cleaned up to restricted use levels, residual contamination must be ALARA AND in no case may exceed 25 millirems per year, assuming the institutional controls are in place, AND may not exceed 100 millirems per year, assuming the institutional controls fail

The NRC rule does provide that alternative decommissioning criteria (i e , it allows establishment of a number different from 25 mRem/year) may be established for "difficult sites with unique decommissioning problems" Alternative criteria are allowed only in the following circumstances

- Residual contamination is reduced to levels that are ALARA.

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**[d] A discussion of CERCLA's Applicable or Relevant and Appropriate Requirements is contained in paper by Dan Miller, Colorado Attorney General's Office, "Response to questions presented at 11/8/00 meeting", dated November 16, 2000. Available online at www rlets gov, under Focus Group.**



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- The person seeking the alternative criteria has demonstrated that it is unlikely the TEDE to the average member of the critical group would exceed 100 mRem/yr, and

- Durable, enforceable institutional controls have been imposed to minimize exposures

It is important again to emphasize the difference between a cleanup level as discussed in the NRC (and state) rule and the soil action level that is being developed by the RFCA parties Action levels are the levels of contamination that trigger a remedial action and cleanup levels are the levels of contamination remaining after an action has been taken In order to comply with the NRC rule as an ARAR, an analysis would be required using the ALARA concept to determine whether cleanup to unrestricted levels or to levels approaching unrestricted use is reasonably achievable for a particular remedial action

CERCLA Guidance

While EPA agrees that the Decommissioning Rule is relevant and appropriate to the cleanup at Rocky Flats, it believes that the dose limits in the rule may not, in some circumstances, be sufficiently protective of human health This concern is discussed in the EPA Guidance Document "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination," August 1997 This document makes the following points relevant to the RSAL debate at Rocky Flats

> Cleanup actions at Superfund sites (such as Rocky Flats) must be protective of human health and the environment and comply with applicable or relevant and appropriate requirements (ARARs)
>
> EPA generally defines "protective of human health" as a level that represents an excess cancer risk to an individual in the range of $10^{-4}$ to $10^{-6}$ (1 in 10,000 to 1 in 1,000,000)
>
> Cancer risks for radioactive contamination should generally be estimated using the slope factor methodology put forth in the EPA risk assessment manual [m] **(Please see attached memo on Radiation Risk and Dose for more information on the issues of slope factors and converting dose to risk.)**
>
> EPA has determined that the dose limits in the NRC rule are generally not protective of human health *The word "generally" is important here because each radionuclide has a different cancer slope factor so for some radionuclides the lifetime cancer risk associated with a 25 mRem/yr dose will be within the acceptable risk range, but for most radionuclides the risk associated with a 25 mRem/yr dose is outside the risk range*

[m] U S EPA, "Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A) Interim Final," EPA/540/1-89/002, December 1989 U S EPA, "Risk Assessment Guidance for Superfund Volume I – Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals", EPA/540/R-92/003, December 1991



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The NRC Rule must be met (or waived) at sites where it has been determined to be applicable or relevant and appropriate Cleanup at these sites will typically have to be more stringent than required by the NRC dose limits *The word "typically" is used for the same reason the word "generally was used in the preceding paragraph*

If a dose assessment is conducted at the site, *as was done at Rocky Flats in setting the current RSALs*, 15 mRem/yr should generally be the maximum dose limit for humans This dose limit equates to approximately $3 \times 10^{-4}$ (3 in 10,000) lifetime risk **(Please see attachment 1 for discussion of how the value $3 \times 10^{-4}$ was calculated)**

Despite these concerns, EPA expects that NRC's implementation of the decommissioning rule will result in cleanups within the Superfund risk range at the vast majority of NRC regulated sites

**WHERE WITHIN THE RISK RANGE (Should a Cleanup Level Fall)?**

There is a lot of room for discussion when a range covers two orders of magnitude as the acceptable risk range does EPA regulations and policies indicate that cleanups which result in site risks being reduced to levels anywhere within the range are acceptable The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) says the $10^{-6}$ risk level will be used as the point of departure for determining remediation goals for alternatives when ARARs are not available The EPA OSWER Directive 9355 0-30, Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions, states that where the cumulative carcinogenic site risk to an individual based on the reasonable maximum exposure for both current and future land use is less than $10^{-4}$ and the non-carcinogenic hazard quotient is less than 1, action is generally not warranted unless there are adverse environmental impacts This indicates that cleanup that reduces site risks to a level of $10^{-4}$ is perfectly acceptable On the other hand, the same directive says once a decision has been made to take an action, the Agency has expressed a preference for cleanups achieving the more protective end of the range (i e $10^{-6}$) In other words, if you are conducting an action to address a site risk greater than $10^{-4}$, explore options for reducing the risk well beyond $10^{-4}$ This idea is consistent with the concept of "As Low As Reasonably Achievable" (ALARA) which says that all reasonable efforts should be made to reduce potential exposure to radiation even if the regulatory safety limit is already being met

When choosing a remedy and the risk level that remedy will achieve, EPA considers the CERCLA balancing criteria (short-term effectiveness, long-term effectiveness and permanence, reduction of toxicity, mobility or volume through treatment, implementability, and cost), and the modifying criteria (community acceptance, and state acceptance)[e] Obviously, cost and implementability are two factors that generally tend to push remedies toward the less stringent end of the risk range The effect of the other

[e] **See, 40 CFR 300 430(e)**

factors may change from one case to another

## LAND USE AND INSTITUTIONAL CONTROLS

As discussed previously, the assumptions made as to how Rocky Flats will be used in the future are very important considerations in the calculation of an RSAL The current RSALs were developed under the assumption that the southern portion of the Industrial Area would see commercial reuse while the surrounding Buffer Zone supported open space recreation When DOE, EPA and CDPHE were negotiating RFCA back in 1995, these two future use scenarios seemed the most likely At that time, there was a significant level of support in the surrounding communities for these two scenarios So the parties wrote them into the agreement The Agencies, in drafting the RFCA, also designated certain parts of the Industrial Area as "restricted open space," although the Agreement doesn't really discuss the implications of that designation Now that Senator Allard and Congressman Udall have introduced legislation that would turn Rocky Flats into a wildlife refuge, it appears a wildlife refuge worker may be the person most directly impacted by residual contamination at Rocky Flats If the future land use assumptions change, it would probably require a revision of the RFCA.

Making decisions on the degree of cleanup based upon the anticipated future land use is consistent with EPA regulations and policy The preamble to the National Contingency Plan (NCP)[f] states that the EPA will consider future land use as residential in many cases In general, residential areas should be assumed to remain residential, and undeveloped areas can be assumed to be residential in the future unless the sites are in areas where residential land use is unreasonable The NCP goes on to say "the assumption of future residential land use may not be justifiable if the probability that the site will support residential use in the future is small " The EPA guidance document "Land Use in the CERCLA Remedy Selection Process," May 25, 1995, says that in general, objectives should be developed that would achieve cleanup levels associated with the reasonably anticipated future land use over as much of the site as possible This guidance was written, at least partly, in response to criticism that EPA was too often assuming that future use of a contaminated site would be residential Many contaminated sites being addressed in the Superfund program were industrial sites in large industrial areas that had little potential for residential redevelopment So it was often argued that it was not cost effective for those sites to be cleaned up to a degree that would support residential use

The NRC Decommissioning Rule does not discuss developing a cleanup level consistent with the anticipated future land use in the same way that EPA guidance does However, the definition of the average member of the "critical group", to which the dose rate standard applies, refers to the "applicable set of circumstances" that leads to the dose Such circumstances include the anticipated future land use. The Preamble to the Decommissioning Rule indicates that a rural farmer future use scenario could be an "applicable set of circumstances" to calculate unrestricted use levels for an average member of the critical group in an unrestricted use scenario The Rule says cleanup levels

[f] **Suggest putting in citation**

that allow unrestricted use are generally preferable to levels that require restricted use DOE agrees that unrestricted use is preferable, but believes the clear intent of the rule to allow restricted use must be acknowledged and those provisions be implemented as appropriate

If the amount of residual contamination at a site precludes unrestricted use in the future, institutional controls (legal controls) must be put in place to assure that the anticipated land use doesn't change to an inappropriate one (e g residential development of property slated to be industrial) When RFCA was signed, DOE, EPA and CDPHE assumed that controls would be utilized to limit future activities on site to commercial reuse of the industrial area and recreational use of the Buffer Zone Continued Federal ownership was one of the controls contemplated for making that assurance Designation as a National Wildlife Refuge would assure Federal Ownership into the foreseeable future and would effectively limit the type of activities that could occur on site

The draft EPA Radiation Sites Cleanup rule anticipated the potential failure of institutional controls when it said if institutional controls were utilized to meet the 15 mRem/yr limit, the site must be cleaned up to levels that ensure individuals are not exposed to doses greater than 85 mRem/yr in the event of institutional control failure The Decommissioning Rule addresses the possible failure of institutional controls in a manner similar to the draft EPA rule It says that a site will be considered for license termination under restricted conditions if, in addition to other conditions, residual radioactivity at the site has been reduced so that if institutional controls were no longer in effect, members of the public will not receive a dose greater than 100 mRem/yr or, under certain circumstances, 500 mRem/yr The anticipation of failure is not required under the Superfund law or any of pa's policy documents Instead, the possibility that institutional controls can fail is addressed through the requirement that five year reviews be conducted at any site where contamination is left at levels that don't allow for unrestricted use Such reviews should analyze the implementation and effectiveness of institutional controls with the same degree of care as other parts of the remedy EPA also believes emphasis must be placed on starting out with a good set of controls as discussed in the new guidance "Institutional Controls A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups," EPA, September 2000

It should be noted that neither DOE, CDPHE nor EPA currently envision a cleanup at Rocky Flats that would result in totally unrestricted use of the entire site Even if cleanup of contaminated soil could be performed to a level that would allow for unrestricted use of the 6,000 plus acres, certain features would remain that would mandate institutional controls These features include municipal waste landfills that will be capped and left in place, a cap over the former solar evaporation ponds, at least three passive ground water treatment systems, contaminated ground water plumes and some number of detention ponds or other engineered controls for surface water



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## AS LOW AS REASONABLY ACHIEVABLE (ALARA)[iv]

The concept of ALARA has been around for many years in the worlds of nuclear power and nuclear weapons Until recently it was primarily applied in the context of worker protection It was employed in the planning of work and, as the name would imply, was an attempt to reduce radiation exposure as much as possible, considering factors such as the specific circumstances necessitating the exposure and the resources available. An example of the ALARA concept would be a nuclear power plant worker who needs to complete a task in an area near the fuel rod assembly An analysis of the situation could determine that given the level of radioactivity measured in the area and the length of time necessary for the worker to complete the task, the dose to the worker from performing the task would be well below the occupational limit The ALARA analysis would ask the question "what additional steps can be taken to further reduce the projected dose?" For example

> Is there protective clothing, beyond what is currently in use, that would reduce the worker's dose?
>
> Could the work be sequenced differently to allow the task to be completed quicker?
>
> Could shielding (lead bricks) be placed between the worker and the fuel rod assembly thereby reducing exposure?
>
> Does the worker have the best tools for the job?

Only in recent years has the concept of ALARA been used in association with environmental restoration The Decommissioning Rule says a site will be considered acceptable for unrestricted use, if radioactivity results in a dose no greater than 25 mRem/yr, and the radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA) Thus, in addition to meeting the minimum cleanup level, all reasonable steps should be taken to reduce the contamination level even further In practice this would mean that in the design of a particular cleanup project, DOE would evaluate additional measures aimed at reducing the contamination levels beyond that called for by the RSAL Additional measures could include excavation of areas where the contamination is below the RSAL Such an evaluation could conclude that for a relatively small increase in cost and time they could remove significant amounts of additional contamination

Of course a key challenge in applying the ALARA process is it's inherently subjective nature, what seems reasonably achievable to one may not to another An ALARA analysis will have to take a number of issues into consideration

> How much dose could be avoided by doing work beyond that required to meet the

[iv] The regulatory definition of ALARA is found in 10 CFR 20 1003

RSAL?

How much would the additional work cost?

Is it technically feasible?

What are the risks to workers and to the public of performing additional work?

Will natural resources/habitat be affected?

What are the offsite risks associated with additional work (e g risk from transportation, risks at the disposal facility)

The rules as to when you do additional work in accordance with ALARA are not hard and fast The NRC Draft Regulatory Guide DG-4006, "Demonstrating Compliance with the Radiological Criteria for License Determination," does contain formulas for use in ALARA analyses These formulas try to quantify the benefits of additional cleanup work by assigning a monetary amount to a unit of averted dose (e g the benefit of avoiding a dose of 1 Rem is given a value of $2,000) The benefits are then compared to the cost of conducting cleanup beyond that necessary to comply with the dose standard The NRC guidance on ALARA says that, based on NRC's analysis, additional soil cleanup will generally not be cost effective if the cleanup already meets the goal of 25 mRem/yr to an unrestricted land use scenario

The concept of ALARA is consistent with the RFCA Vision which states where possible, the site will be cleaned up to the maximum extent feasible

## PROPOSED FRAMEWORK FOR RSALS AND CLEANUP DECISIONS

With respect to the regulatory foundation upon which an RSAL will be constructed the key factors are acceptable dose and/or acceptable level of risk, future land use assumptions and ALARA

### Acceptable dose and/or acceptable risk.

As previously discussed, the Decommissioning Rule is one of the key requirements that will govern the cleanup at Rocky Flats So at a minimum the cleanup will have to reduce the contamination to meet the dose limits in the Rule Dose assessments will be performed to calculate an RSAL that meet the 25 mRem/yr dose limit to a future user Given the concern that the 25 mRem/yr dose limit may not be protective of human health, at least for some radionuclides, the DOE, EPA and CDPHE will also calculate RSALs based on risk, and choose the more conservative value between dose and risk So the only way the RSAL will be based on the 25 mRem/yr dose would be if the risk associated with the dose fell within the risk range DOE, CDPHE and EPA are considering the idea of choosing a specific value within the risk range upon which to base a RSAL However, since we are not prepared at this time to choose a specific value, the Agencies will calculate levels of



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residual contamination corresponding to the risk levels of $10^{-4}$, $10^{-5}$ and $10^{-6}$

## ALARA

In accordance with the decommissioning rule, an ALARA analysis will be required for each cleanup project This analysis will be performed at the time the time the project is being designed, when all the necessary characterization data and historical information has been compiled DOE will develop a detailed protocol for how these analyses will be conducted, in consultation with CDPHE, EPA, Local Communities and the Public, which will outline factors to be considered and how those factors will be weighted in the final analysis This process for determining ALARA will incorporate CERCLA balancing and modifying criteria discussed earlier. The ALARA analysis will be part of the regulatory decision document for each cleanup project The results of the analysis and the proposed action based upon the consideration of the analysis are subject to the normal decision document review and regulatory approval process This includes consideration of any public review comments

## Future Land Use Assumptions

The Decommissioning Rule states that a site may be released for unrestricted use if residual radioactivity that is distinguishable from background is ALARA, and would not result in a dose in excess of 25 mRem/yr to a future user in an unrestricted scenario The Rule says a site may be cleaned up to a less stringent level if the party performing the cleanup can demonstrate either (1) the additional cleanup necessary to qualify for an unrestricted release would cause net public or environmental harm, or (2) the contamination levels associated with restricted use are ALARA. Thus, the RFCA Parties will consider both restricted and unrestricted scenarios in the development of RSAL and cleanup levels The RFCA parties have chosen eight scenarios to be evaluated as shown in the table below

The table will be completed and distributed as part of the task 3 report and will list a specific activity in pCi/g for each scenario and associated dose/risk level The table will be used to choose an RSAL, based on an anticipated future user, and to determine the level that represents an unrestricted future land use scenario In addition, the table may be a useful tool in guiding stewardship and post-closure stewardship discussions and decisions [v]

RSAL TABLE FOR SELECTED SCENARIOS, DOSE AND RISK

| Land Use Scenarios | 25 mRem/yr | Lifetime Risk=10-4 | Lifetime Risk= 10-5 | Lifetime Risk= 10-6 |
|---|---|---|---|---|
| Restricted | | | | |
| Open Space User - Adult | | | | |
| Open Space User - Child | | ---------- | ---------- | ---------- |
| Office Worker | | | | |

[v] The RFCA Parties have not had substantive discussions on the value of retaining the existing two-tiered system for RSALs, but we may wish to discuss the issue at a future Focus Group meeting

| | | | |
|---|---|---|---|
| Wildlife Refuge Worker | | | |
| Unrestricted Scenarios | | | |
| Suburban Resident - Adult | | | |
| Suburban Resident - Child | ---------- | ---------- | ---------- |
| Resident Rancher - Adult | | | |
| Resident Rancher - Child | ---------- | ---------- | ---------- |

The values for this table will be calculated and distributed as part of the Task 3 Report

The open space user scenario was chosen because it is currently contemplated in the RFCA, and it is quite possibible that members of the public would use the Site for open-space recreation should the site be designated a National Wildlife Refuge The Office Worker scenario was selected because it too is currently contemplated in the RFCA, however at this time commercial reuse of the site does not appear likely Wildlife refuge worker was chosen because this is the reasonably anticipated future user We chose the suburban resident because we believe this is the land use that would most likely occur if the site were opened up for unrestricted use Finally, the resident rancher scenario was chosen so the values calculated could be compared against those calculated by RAC DOE, CDPHE and EPA do not believe the resident rancher scenario is likely as long as the Front Range is a thriving metropolitan area

**Proposal for the RSAL and Cleanup Decisions**

We propose that the RSAL be based on the reasonably anticipated land user, the refuge worker The RSAL will be used to determine where cleanup actions will be taken at Rocky Flats Once an action has been determined to be necessary (i e contamination is present in excess of the RSAL), the alternatives analysis, including application of the ALARA process, for that action will include cleanup to a level that supports unrestricted use, the suburban resident scenario In other words, for each area of the site where contamination exceeds the RSAL, DOE will perform an evaluation to determine what level of contamination removal is reasonably achievable While we have serious doubts that the entire site can be cleaned to unrestricted use, it is certain that such a level can be achieved for many of the contaminated areas at Rocky Flats The first ALARA analysis will occur in conjunction with planning for the 903 pad remedial action and will give careful consideration to the issue of surface water protection

**SUBSURFACE RSALS AND SURFACE WATER PROTECTION**

The RSAL we plan to develop using the framework above is meant to be protective of the anticipated future user and will only be used to address surface contamination Calculations as to what an appropriate RSAL for buried contamination in the Industrial Area will be performed at a later time when more is known about the nature and extent of such contamination, and the possible routes of exposure Furthermore, the proposed RSAL is not meant to be protective of the surface water standards Meeting the RSAL will in no way guarantee that the surface water standard won't be violated DOE is obligated under the RCA to meet the surface water standard, and will have to take the necessary steps to do so This could include excavation of contamination to levels below



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the RSAL, re-contouring of areas in and around the industrial area, stabilization measures or the construction of engineered controls Attachment 2 illustrates many of the factors to be considered in decisions made for the protection of surface water standards